APPENDIX

Docket # 67506

SHIFTING DEVICE OF A MOTOR VEHICLE TRANSMISSION

FIELD OF THE INVENTION

The present invention pertains to a shifting device of a motor vehicle transmission with a selector lever and kinematic transmission for transmitting the selecting movements to the automatic transmission, wherein the selector lever can be moved in an automatic shift gate for selecting automatic gears and in a sequence shift gate for manually upshifting and downshifting of gears.

BACKGROUND OF THE INVENTION

A shifting device of a motor vehicle automatic transmission, which has a selector lever

and a kinematics for transmitting the selection movements to the automatic transmission, wherein the selector lever can move in an automatic shift gate for selecting automatic gears and in a sequence shift gate for manually upshifting and downshifting gears, has been known from German Offenlegungsschrift No. DE 195 26 059 A1. The shifting device is designed such that the automatic shift gate is arranged on the right when viewed in the direction of travel and the sequence shift gate is located to the left of it. The embodiment of the shifting device shown is designed for a vehicle with the steering wheel on the left. If a corresponding shifting device is to be installed in a vehicle with the steering wheel on the right, the automatic shift gate and the sequence shift gate must be transposed in their arrangement for ergonomic reasons, i.e., the automatic shift gate is located on the left-hand side when viewed in the direction of travel and the sequence shift gate to the right of it in a vehicle with the steering wheel on the right. To bring about this reversal, it is necessary to manufacture the shifting device in a mirror-image version. Such measures always mean great efforts, because new sets of drawings must be prepared and new tools must be manufactured and NC programs must be rewritten. In addition, it is necessary concerning the stocking of spare parts to stock both types of shifting device. All the above-mentioned measures lead to a considerable cost.

SUMMARY AND OBJECTS OF THE INVENTION

The primary object of the present invention is to provide a shifting device for an automatic transmission with sequence shifting possibility, which is essentially identical for vehicles with the steering on the right-hand side and for vehicles with the steering on the left-

hand side.

According to the invention a shifting device of a motor vehicle automatic transmission with a selector lever and kinematics for transmitting the selection movements to the automatic transmission is improved, wherein the selector lever can be moved in the known manner in an automatic shift gate for selecting automatic gears and in a sequence shift gate for manually upshifting and downshifting gears. The improvement according to the present invention provides for the shifting device to have three movement spaces located next to one another for the selector lever, wherein two adjacent movement spaces each provided for respective different shifting functions (e.g., shifting between automatic gears and sequential shifting).

With a shifting device of such a design, it is now possible to use the same shifting device in vehicles with the steering on the right and those with the steering on the left, and the middle movement space can be used for the automatic shift gate in both types of vehicle, while the left-hand movement space can be used for the sequence shift gate in a vehicle with the steering on the left and the right-hand movement space can be used for the sequence shift gate in a vehicle with the steering on the right.

In a preferred embodiment, the shifting device is additionally provided with a movement gate for the selector lever, which movement gate has an automatic shift gate and at least one sequence shift gate. By replacing the movement gate, the shifting device, which is otherwise the same, can be used for both vehicles with the steering wheel on the left and vehicles with the steering wheel on the right as desired.

The movement shifting gate of the shifting device is preferably designed such that it has

a single automatic shift gate and a single sequence shift gate, with a connection gate (selection gate) being provided between the automatic shift gate and the sequence shift gate. The selector lever can be moved over via this selection gate from a defined automatic position (mostly position "D") to the sequence shift gate or from the sequence shift gate back into the automatic shift gate.

Corresponding to another advantageous embodiment of the shifting device, it is provided that a first shift axis be provided for the selector lever in the automatic shift gate and that a second shift axis be provided in the sequence shift gate, wherein the selector lever is movable only around one of the shift axes, depending on the shift gate selected or the movement space corresponding to the shift gate. The first shift axis and the second shift axis are preferably arranged eccentrically in relation to one another here, and the distances between the first shift axis and the second shift axis, on the one hand, and a shift knob at the end of the selector lever, on the other hand, may in turn differ substantially. It is achieved as a result that the shift knob moves on radii of different size depending on the shift gate and depending on the movement space.

Corresponding to the idea of the invention, the inventor also proposes that a shifting device or a shifting device that has the above-mentioned features be improved such that the shifting device

- has a central carrier pivotable around a selector axis,
- has an inner bridge, which is pivotably mounted on the central carrier and is pivotable around a first shift axis extending essentially at right angles to the selector axis, and

- has a pivotable outer bridge, which is mounted and pivotable on the inner bridge around a second shift axis and is connected to the selector lever.

Furthermore, it is proposed according to a preferred embodiment that the shifting device be provided with at least one locking element engagement and at least one locking element, wherein these cooperate with the inner and outer bridges such that at least one locking element and at least one locking element engagement mutually engage one another in defined pivoted positions of the central carrier, and consequently also of the inner and outer bridges, while no locking element and no locking element engagement engage one another in another pivoted position of the central carrier, i.e., the outer bridge can be pivoted around the second shift axis in relation to the inner bridge. It is preferred in this embodiment that the first shift axis extends through the locking element, of which there is at least one. It is made possible by this embodiment that the locking element and the locking element engagement form a type of additional axis of rotation, which extends concentrically with the first shift axis.

The locking element, of which there is at least one, and the locking element engagement, of which there is at least one, are preferably arranged such that in the case of mutual engagement, they bring about a connection between the inner bridge and the outer bridge, which connection rotates in unison.

Corresponding to another, advantageous embodiment of the shifting device, means for limiting movement gates and/or movement spaces may be provided. These means may be fastened partly on the housing and/or partly on the inner bridge and/or partly on the outer bridge. Due to these limiting means, the possible paths of the selector lever may be arranged

either liberally, i.e., with a corresponding clearance, as a result of which movement spaces are formed, or the limiting means are designed such that movement space is available to the selector lever essentially in only one direction, so that corresponding movement gates are formed, which can then represent the shift gates.

Provisions are made in other preferred embodiments of the shifting device for providing a cable or a linkage for transmitting the shifting movement of the selector lever to the motor vehicle transmission in at least one gate. In addition or as an alternative, the shifting movement of the selector lever may also be transmitted to the motor vehicle transmission in at least one shift gate via an electronic transmission device, wherein this type of transmission is preferably used in the sequence shift gate.

In addition, it is advantageous to equip the shifting device with a prior-art "Key Lock" system and/or a "Shift Lock" system.

It is evident that the features of the present invention which were mentioned above and will be explained below are applicable not only in the particular combination described, but also in other combinations or alone without going beyond the scope of the present invention.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference is made to the accompanying drawings and descriptive matter in which preferred embodiments of the invention are illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Figure 1 is a shifting device according to the present invention in a 3D side view from the right with the selector lever in the middle position in the automatic shift gate;

Figure 2 is a shifting device according to the present invention in a 3D side view from the right with the selector lever in position "P" in the automatic shift gate;

Figure 3 is a shifting device according to the present invention in a 3D side view from the left with the selector lever in position "P" in the automatic shift gate;

Figure 4 is a shifting device according to the present invention in a 3D side view from the right with the selector lever in the middle position in the right-hand sequence shift gate;

Figure 5 is a shifting device according to the present invention in a 3D side view from the right with the selector lever retracted in the right-hand sequence shift gate;

Figure 6 is a 3D side view of the inner and outer bridges with parts of the housing from the right with the selector lever in the middle position in the automatic shift gate;

Figure 7 is a 3D side view of the inner and outer bridges with parts of the

housing from the right with the selector lever in the middle position in the sequence shift gate;

Figure 8 is a 3D side view of the inner and outer bridges with parts of the housing from the right with the selector lever retracted in the sequence shift gate;

Figure 9 is a 3D view of the inner and outer bridges with parts of the housing from behind with the selector lever in the sequence shift gate;

Figure 10 is a 3D side view of the inner bridge;

Figure 11 is a 3D side view of the outer bridge;

Figure 12 is a 3D side view of the central carrier;

Figure 13 is a schematic representation of the movement spaces I, II and III;

Figure 14 is a schematic representation of the movement spaces I, II and III;

Figure 15 is a schematic view of the movement spaces and movement gates in Section A-A in Figures 16 and 17;

Figure 16 is a schematic sectional view of the movement spaces and movement gates from the rear;

Figure 17 is a schematic sectional view of the movement spaces and movement gates from the side; and

Figure 18 is a 3D view of the shifting device with the selector lever in two different positions in the automatic shift gate and in a middle position in the sequence shift gate.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings in particular, Figures 1 through 5 show different 3D views of a preferred exemplary embodiment of the shifting device according to the present invention with different positions of the selector lever. The design of this shifting device with its kinematically effective elements is symmetrical to planes through the shifting device, which extend in the longitudinal direction of the vehicle and at right angles thereto.

The shifting device 1 comprises essentially a central carrier 6, which is mounted in a housing 2, which is shown only partially here, around a selector axis 9 extending in the longitudinal direction of the vehicle. The central carrier 6 has a cutout 6.1 on both longitudinal sides for a mounting insert 11. The central carrier 6 is laterally surrounded by a U-shaped, inner bridge 4, which has on both sides a round axial opening 4.1, which is engaged by the mounting insert 11 with the axial element 11.1, so that the inner bridge is rotatably movable around the axis formed by the mounting insert 11. The mounting inserts 11 arranged on both sides on the central carrier 6 thus generate a first shift axis 7, around which the inner bridge 4 can be pivoted. In addition, there is a pivoting possibility of the central carrier 6 around the selector axis 9 extending at right angles to the shift axis 7 within the housing 2.

The inner bridge 4 is itself surrounded in turn by an outer bridge 5, and the inner and outer bridges 4 and 5 are connected to one another in the upper area rotatably movably by the second shaft axis 8. Furthermore, the outer bridge 5 has one locking element 12.1 and 12.2 each on both sides in the lower area, which engage each locking element engagements 2.1 and 2.2 arranged on both sides on the housing 2 in the middle position, and the locking element

engagements 2.1 and 2.2 are parts of the housing 2, which is rigidly connected to the vehicle. The locking elements 12.1 and 12.2 and the locking element engagements 2.1 and 2.2 are arranged on the outer bridge 5 such that when they are engaged, they extend concentrically with the first shift axis 7. Consequently, if the selector lever and consequently the outer bridge 5 are in the middle movement space, a pivoting movement of the selector lever 3 in the longitudinal direction of the vehicle is transmitted via the outer bridge 5 and via the second shift axis 8 to the inner bridge 4, which will now likewise be pivoted around the first shift axis 7. If a sideways movement of the selector lever 3 takes place, the locking elements 12.1 and 12.2 become disengaged from the locking element engagements 2.1 and 2.2, so that a pivoting movement of the selector lever 3 in the longitudinal direction of the vehicle is no longer transmitted as a rotary movement around the first shift axis to the inner bridge 4, but it leads only to a rotary movement of the outer bridge 5 around the second, upper shift axis 8. To disengage the locking elements 12.1 and 12.2 from the locking element engagements 2.1 and 2.2, it is irrelevant in this case whether a pivoting movement of the selector lever takes place to the right or to the left.

Consequently, three different movement spaces are thus formed for the selector lever 3 with different kinematic effects, wherein two adjacent movement spaces each are to be assigned to different functions. The selector lever 3 can be moved forward and backward in the direction of the vehicle in the middle movement space, as a result of which pivoting of the inner bridge 4 around the first shift axis 7 is generated. If the selector lever 3 is deflected sideways, a fundamentally new kinematic situation arises on both sides, because the inner bridge

4 is now stopped despite a pivoting movement in the longitudinal direction of the selector lever 3 and only a pivoting movement of the outer bridge 5 around the second, upper shift axis 8 takes place. Consequently, three movement spaces have been created, which can have at least two fundamentally different functions. As is shown in this exemplary embodiment, it is possible in the middle movement space to connect the lower arm of the inner bridge 4 to a cable or a linkage, which transmits the pivoting movement in the middle movement space to an automatic transmission. The selection of the different gears of an automatic transmission is usually controlled by this movement. Furthermore, both the right-hand movement space and the left-hand movement space of the selector lever 3 can be used to trigger the sequence shifting of an automatic transmission. Mostly electronic sensors, which respond, e.g., exclusively to a relative movement between the inner bridge 4 and the outer bridge 5, are used for this purpose. However, it is also possible to arrange sensors, e.g., in the cover, and to forward the movement information electronically from there. Since the shifting movements of the selector lever in the lateral movement spaces do not induce any movements of the inner bridge 4, the cable connection to the transmission may also remain engaged despite shifting movements of the selector lever without triggering shifting operations via the cable. The possibility of movement of the outer bridge 5 is guaranteed by an elongated hole in the axial element 11.1.

For better guiding and for limiting the movement spaces of the selector lever 3, guide elements 2.3 through 2.5, which are rigidly connected to the housing 2, which is shown only partially, are additionally provided in the exemplary embodiment shown. The guide elements 2.3 and 2.4

represent a movement shaft acting in both directions, into which the inner and outer bridges 4 and 5 can be introduced by laterally pivoting the selector lever 3. If the selector lever 3 and consequently the inner and outer bridges 4 and 5 are in a lateral position, the respective guide elements 2.3 and 2.4 prevent the inner bridge 4 from tilting, while the outer bridge 5 continues to be movable around the second shift axis 8. In addition, the guide of the selector lever 3 is still guided by the guide elements 2.5.

The selector lever 3 is in the middle position in the middle movement space in Figure 1.

Figure 2 shows the same view as Figure 1, but the selector lever 3 is in the middle movement space in a front position. This corresponds to position "D" of the automatic transmission.

Figure 3 shows the shifting device 1 with the selector lever 3 in the same position as in Figure 2, but from the opposite side.

Figure 4 shows the shifting device 1 with the selector lever 3 in a lateral movement space, i.e., in a sequence shift gate in this case, wherein the selector lever 3 is in the middle position in terms of its pivoting movement in the direction of the vehicle. It can be clearly recognized that the locking element 12.2 has been disengaged from the locking element engagement 2.2, so that the outer bridge 5 can be pivoted around the second shift axis 8 and is also pivoted relative to the inner bridge 4 in this example.

In addition, a "Key Lock" system 10 and a "Shift Lock" system 14 are also shown in Figures 1 through 5. Both systems have been known per se from the prior art, e.g., from the

Applicant's Patent Application No. DE 197 56 034, whose disclosure content is herewith taken over into the application (hereby incorporated by reference), and their functions will not therefore be described in detail.

For illustration, Figures 6 through 9 show once again different 3D views of the cooperation between the inner bridge 4 and the outer bridge 5 and the guide parts 2.3 through 2.5 of the housing 2, not shown.

Figure 6 shows the inner bridge 4 with the two axial openings 4.1, which is engaged in the assembled state by the axial element 11.1 of the mounting insert 11. The outer bridge 5 surrounds the inner bridge 4, and the two arms of the bridges also have in the lower area an axial opening 5.1, into which the locking elements 12.1 and 12.2 can be inserted, and these locking elements will then optionally cooperate with the locking element engagements 2.1 and 2.2 of the housing 2. In this representation, the selector lever 3 is in the middle movement space, which corresponds mostly to the automatic shift gate.

Figure 7 shows a view similar to that in Figure 6, but the selector lever 3 is pivoted laterally here and is in a middle position in relation to the pivoting movement around the second shift axis 8.

Figure 8 shows how the selector lever 3 is deflected around the second shift axis 8 in a sequence shift gate against the direction of the vehicle. It can be clearly recognized here that the axial openings 4.1 and 5.1 have positioned themselves eccentrically to one another.

Figure 9 shows the situation from Figure 8 in a front view in the longitudinal direction of the vehicle.

Figures 10 through 12 show the shifting device divided according to individual parts. Figure 10 shows the inner bridge 4 with the axial opening 4.1 for the first shift axis 7 and the lever arm arranged under it with the cable junction 13. The axial opening 4.2 for the second shift axis 8 and two slots 4.3 arranged on both sides, through which the outer bridge 5 is inserted and is then connected to the inner bridge 4 rotatably movably via pushed-in pins, are arranged above the axial opening 4.1. A crossbeam 4.4, which has, invisibly here, a catch mechanism in the longitudinal direction of the vehicle and a catch mechanism in the transverse direction of the vehicle on the lower side, is located in the upper area.

Figure 11 shows the outer bridge 5, which is connected to the selector lever 3 on the upper crossbeam. A tie rod 15, which cooperates with a locking bar 16, extends within the selector lever 3 in the known manner. The outer bridge 5 has an axial opening 5.1 in the lower area, into which the locking elements 12.1 and 12.2 are inserted, and it has an axial opening 5.2 in the upper area, into which a pin for establishing connection between the inner and outer bridges is inserted. The pin acts as a second shift axis 8.

Figure 12 shows the central carrier 6 with the selector axis 9 and the laterally arranged openings 6.1 for the mounting insert 11. The mounting inserts 11 arranged on both sides have an axial element 11.1 each, which, usually made of a plastic, engages the axial opening 4.1 of the inner bridge 4. A locking cam 6.4, which can limit the movement of the selector lever 3 in the desired manner in cooperation with the tie rod 15 and the locking bar 16, is located on the top side of the central carrier 6 in the front area. Furthermore, a locking roller 6.2 and a locking roller 6.3 are arranged on the top side. The locking roller 6.2 is used to lock a sideways

movement, while the locking roller 6.3 is used to lock a pivoting movement of the inner bridge in the direction of the vehicle.

To illustrate the idea of the present invention, Figures 13 through 17 show schematic representations of the movement spaces of the selector lever of the device according to the present invention and optionally of the movement gates arranged therein.

Figures 13 through 15 show a section A-A from Figures 16 and 17 and show the movement spaces of the example of a shifting device according to the present invention in one plane. Figure 13 show the movement spaces I, II and III, whose top view consists of three rectangles arranged next to one another. The middle rectangle II corresponds to the movement space that can be assigned to an automatic shift gate, while the movement spaces I and III arranged on both sides, which are parallel to one another in their longitudinal orientation, represent the movement spaces that can be used for the sequence shift gate or optionally also for two different functions.

Figure 13a shows as an example two shift gates, namely, the automatic shift gate AG and the sequence shift gate SG1, where the two shift gates are in connection with one another via the selector gate WG1. Such an embodiment of the shift gate is considered essential when a catch mechanism 6.4 corresponding to the example described in detail above is present in the automatic shift gate.

If the shifting device with the movement spaces being represented here is used in vehicles with different positions of the steering wheel (vehicles with the steering wheel on the right or on the left), the arrangement of the shift gates can be adapted to the positioning of the

driver's seat in a simple manner, e.g., by replacing the cover. The modification in the shifting device proper, which is otherwise complicated, can be omitted.

Figures 14 and 15 show a corresponding example of a shifting device with the same movement spaces I through III. The difference between the two designs of a shifting devices in Figure 14 and Figure 15 is that a mirror-inverted cover with movement gates arranged correspondingly mirror-symmetrically for the selector lever is used.

Figure 16 once again shows schematically a front view of the movement spaces I, II and III, while Figure 17 shows a side view of the same movement spaces, Figure 17 showing the positions, especially of the first shift axis 7 and of the second shift axis 8 as well as the position of the selector axis 9.

To illustrate the idea of the present invention even more, Figure 18 shows the possible positioning of the selector lever, including the movement gates. This Figure 18 shows a shifting device corresponding to Figure 1 in the same view. The positioning of the bridges 4 and 5 and of the central carrier 6 as indicated shows the situation with the selector lever 3 in a middle position in the automatic shift gate. The two selector lever positions 3.1 and 3.2 additionally shown next to it show different movement situations of the selector lever. The selector lever position 3.1 corresponds to a position of the selector lever 3 in the automatic shift gate in the frontmost position (position "P"), while the selector lever is shown in position 3.2 in the position in which it is disengaged to the left into the sequence shift gate. Above the selector lever are shown the circle arc of the automatic gate AG with a deflection possibility by 28°, which can be swept by the selector lever and, to the side of it, the circle arc in the sequence shift

gate SG1 with a deflection by plus/minus 6° around the second shift axis 8. The circle arc of the selector gate WG1, via which changeover between the automatic shift gate and the sequence shift gate is possible by moving the selector lever by an angle of 11° is possible, is located between the automatic shift gate AG and the sequence shift gate SG1.

The right-hand side of the possible positionings of the selector lever 3 in the right-hand sequence shift gate is additionally indicated by broken line with the reference number 3.3.

On the whole, the shifting device according to the present invention is consequently a shifting device that is suitable for an automatic transmission with sequence shifting possibility, where the identical shifting device can be used for a changeover between vehicles with the steering wheel on the right and on the left.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

ABSTRACT OF THE DISCLOSURE

A shifting device of a motor vehicle transmission with a selector lever (3) and a kinematic elements (4-9) for transmitting the selection movements to the automatic transmission, wherein the selector lever can be moved in an automatic shift gate for selecting automatic gears and in a sequence shift gate for manually upshifting and downshifting gears. The shifting device (1) has three movement spaces (I, II, III), which are located next to one another and are preferably directed essentially in parallel to one another, and two adjacent movement spaces (I, II and/or II, III) each are provided for different functions.

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Fig. 1

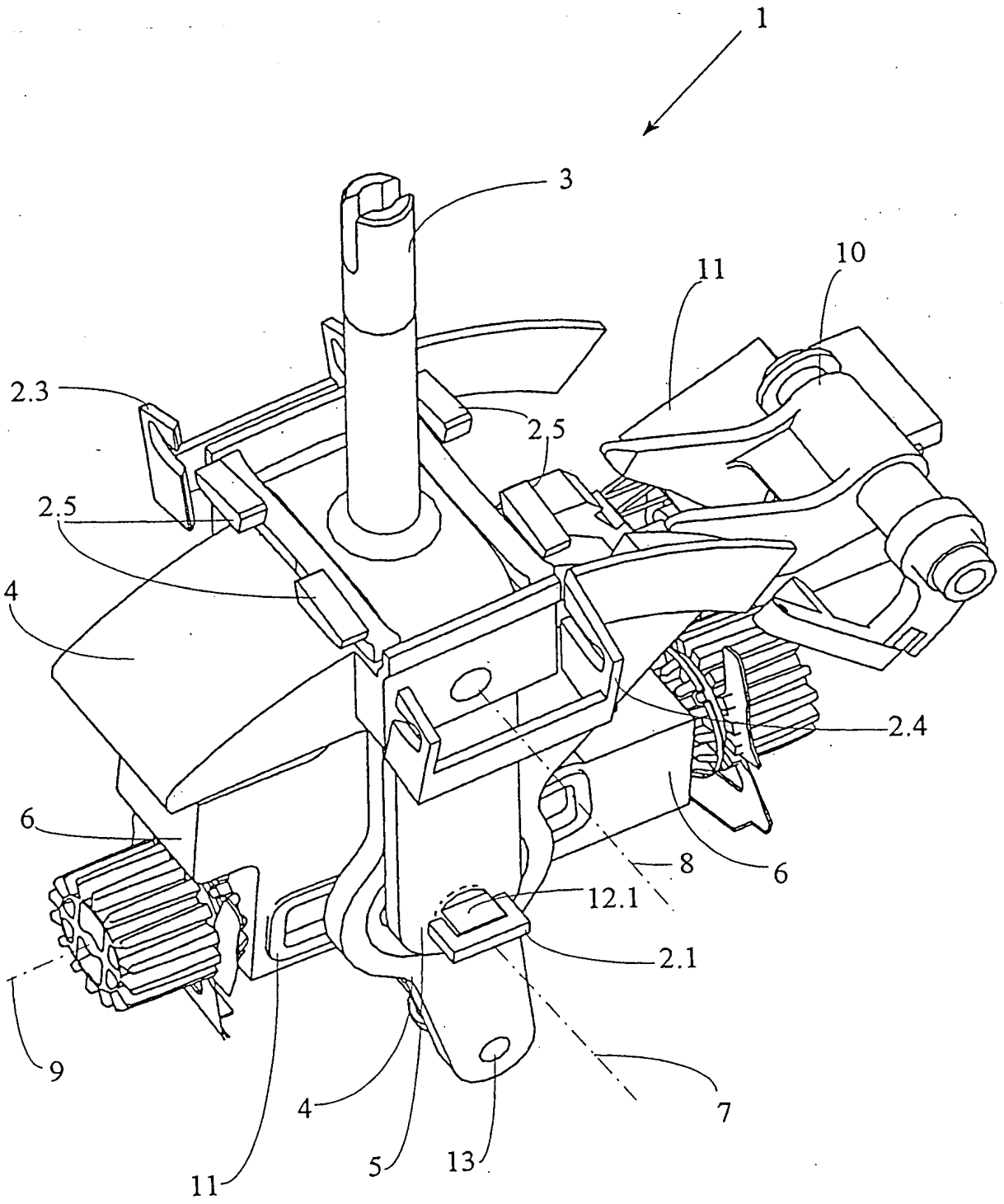


Fig. 2

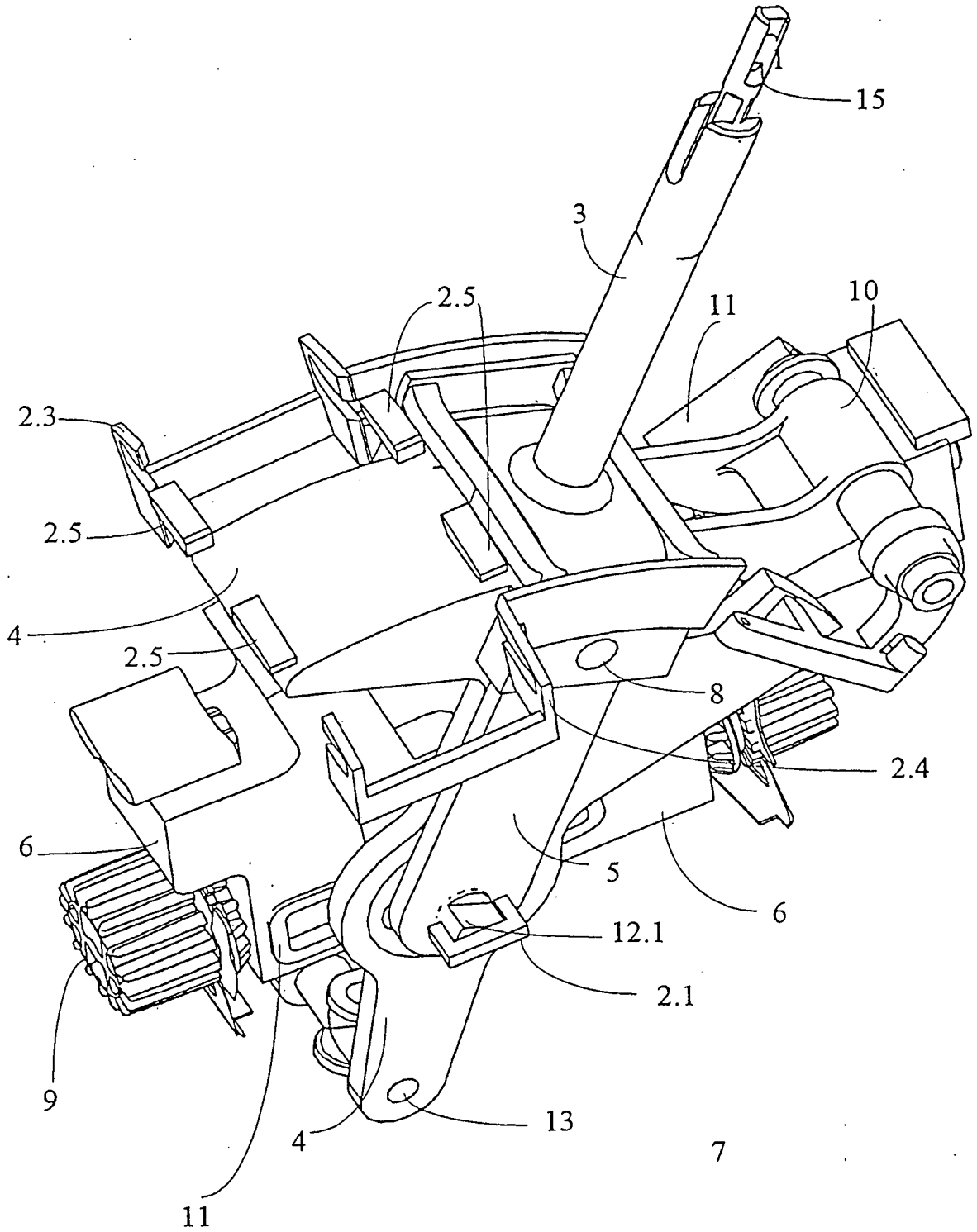


Fig. 3

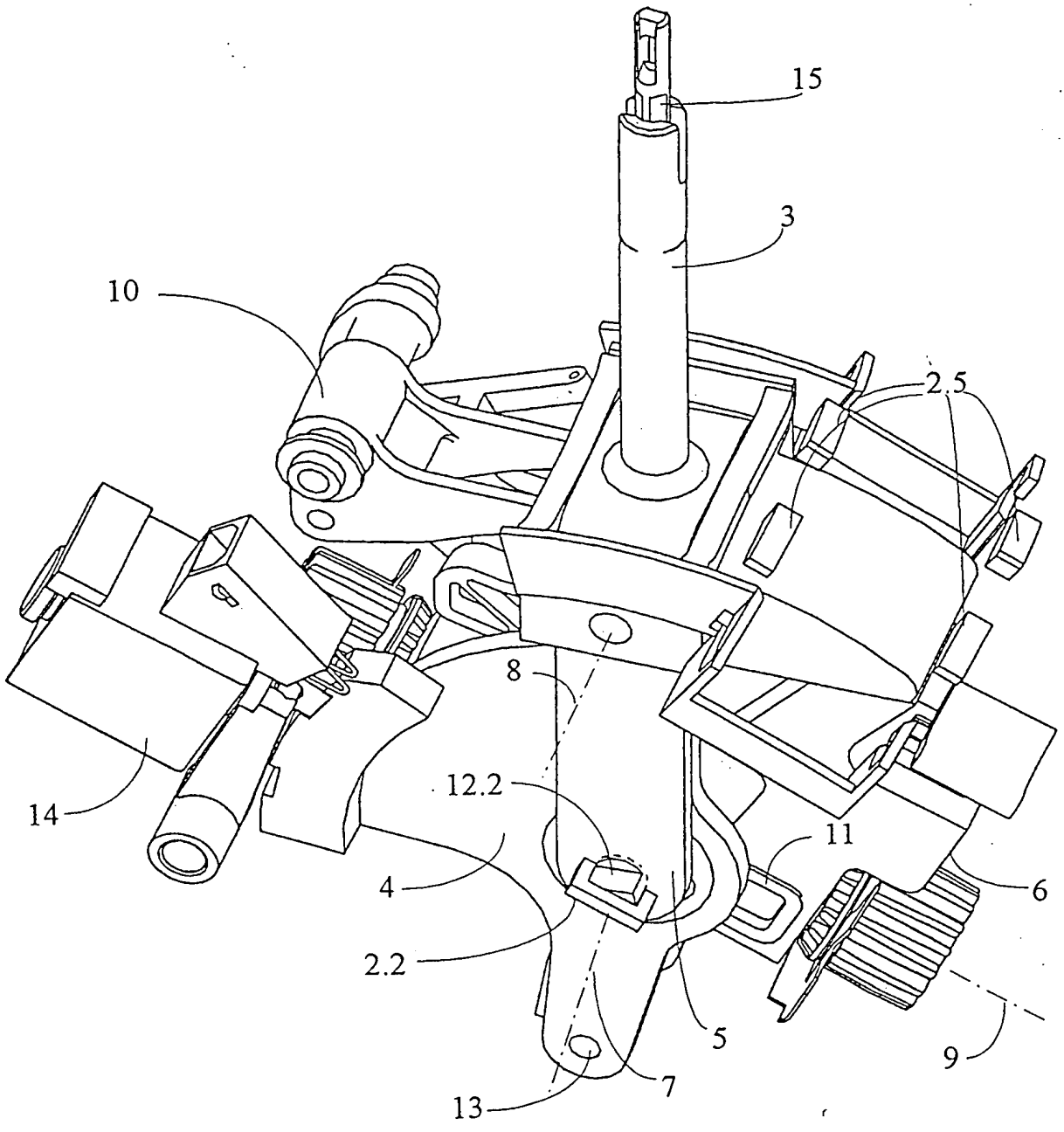


Fig. 4

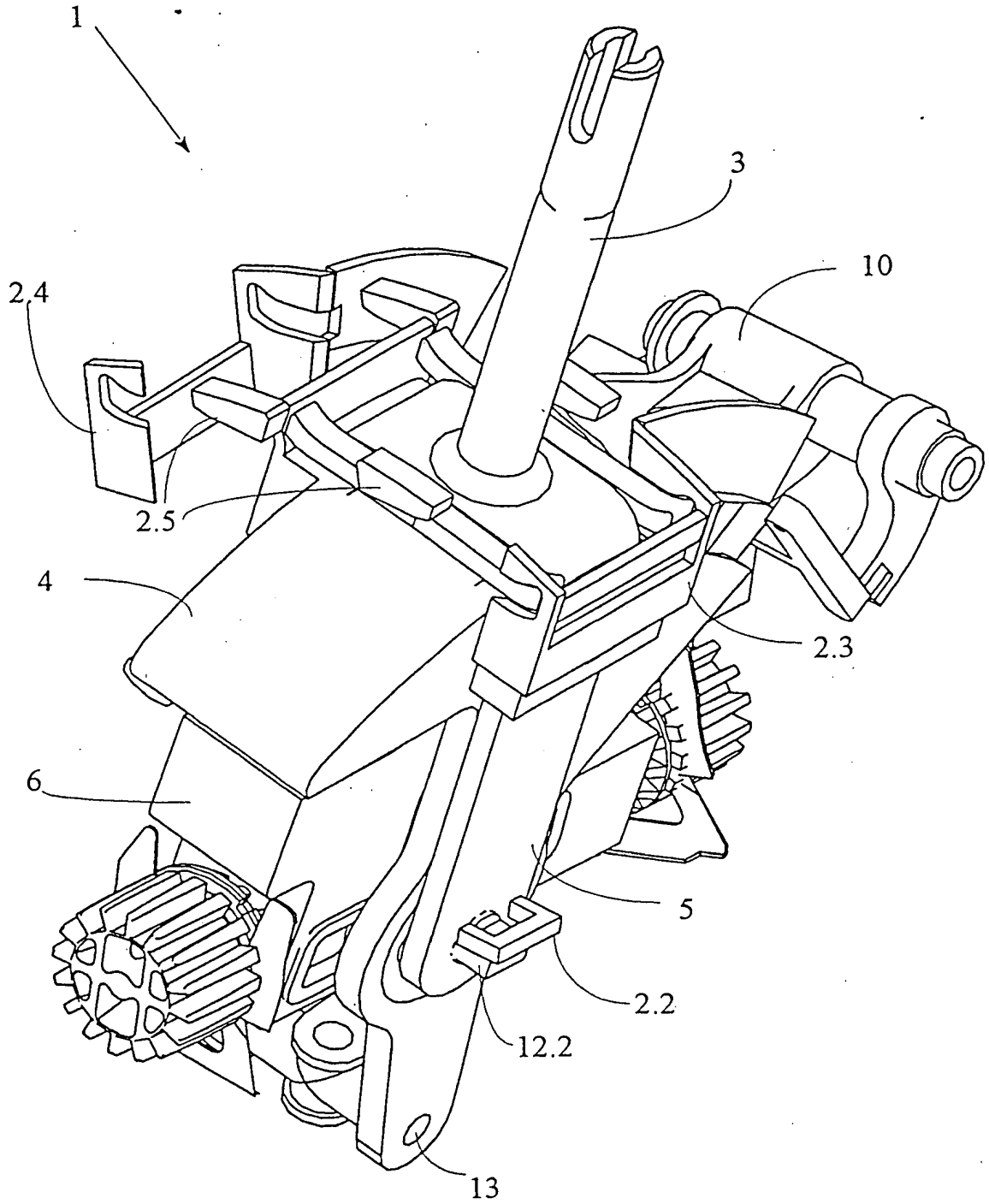


Fig. 5

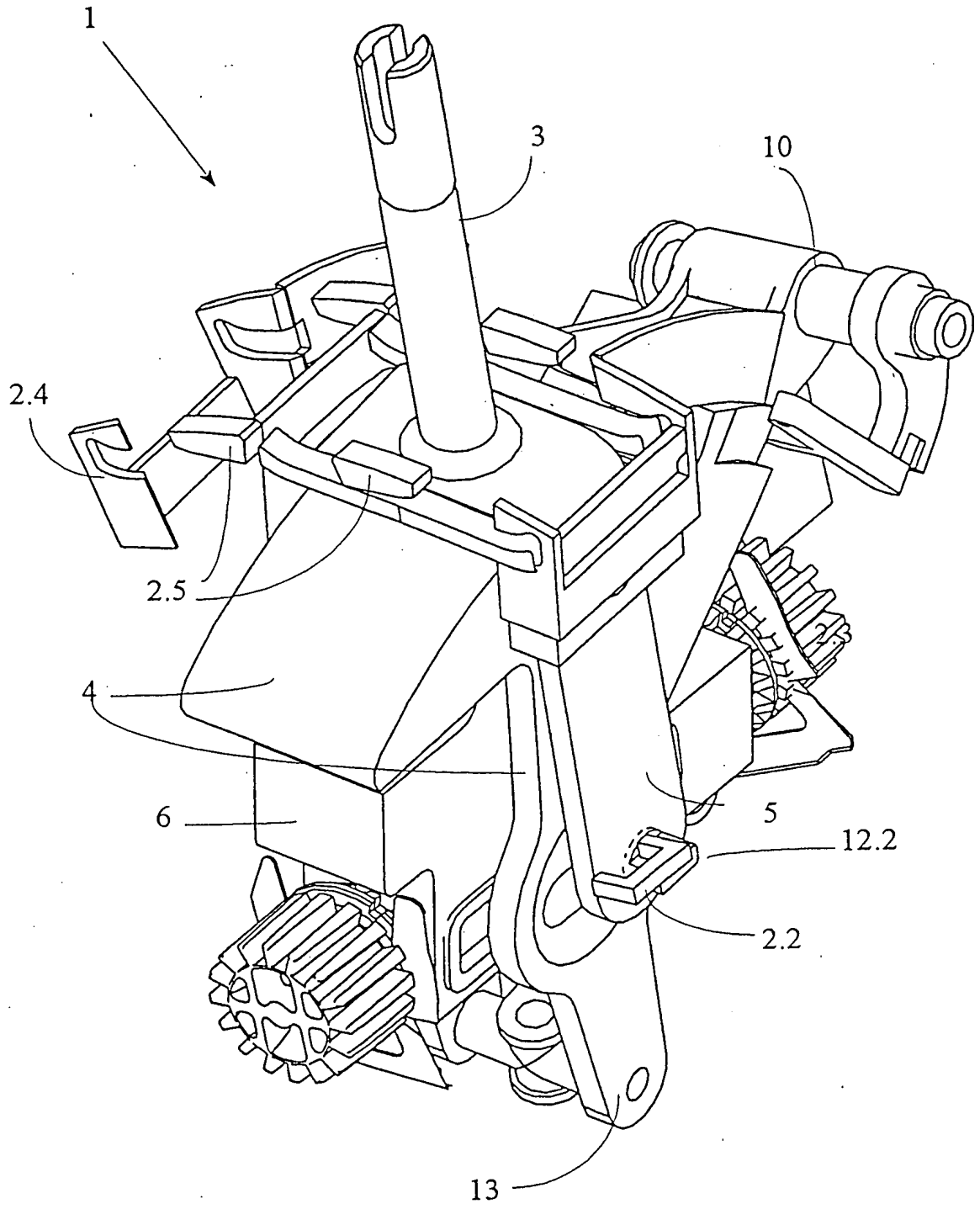


Fig. 6

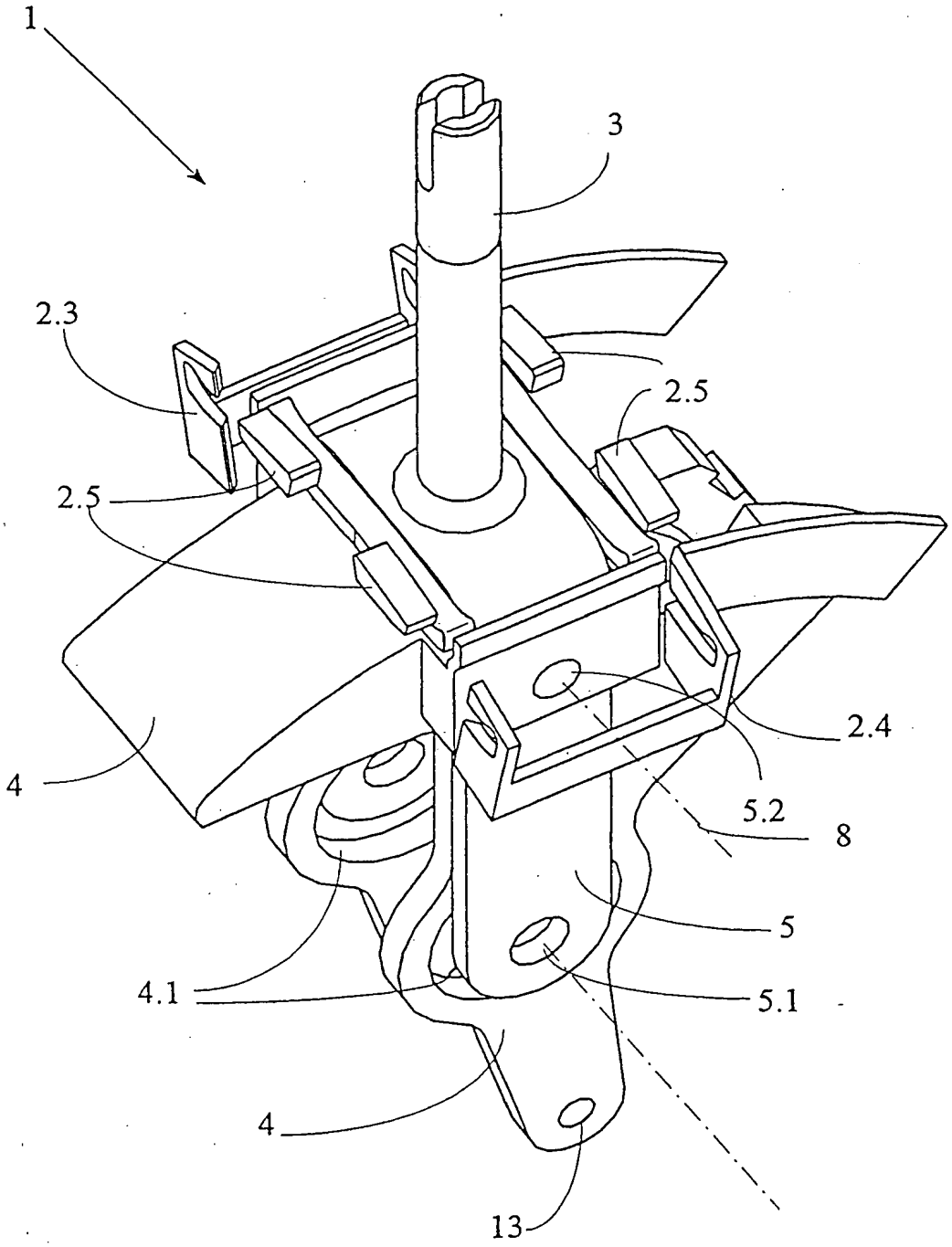


Fig. 7

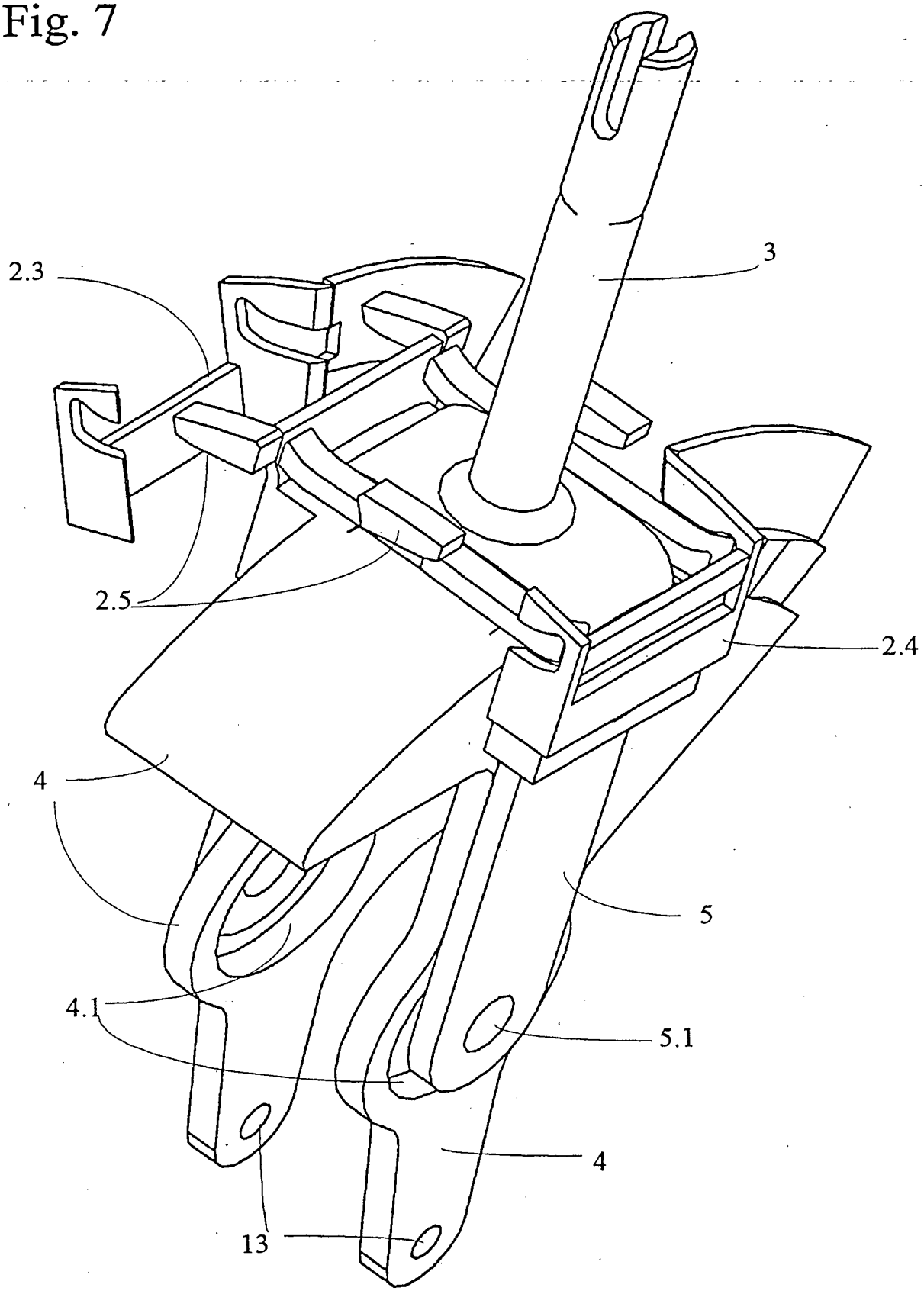


Fig. 8

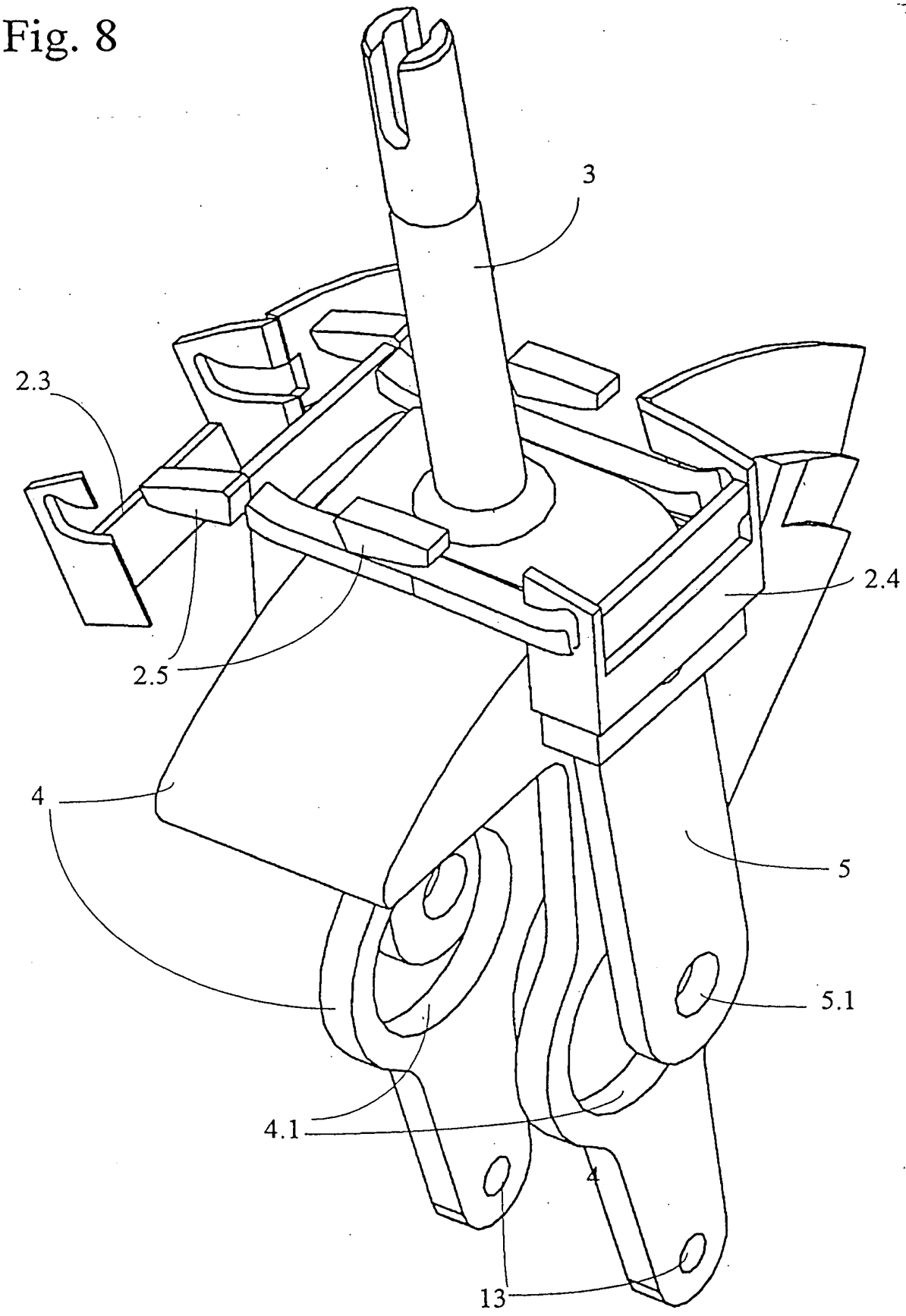


Fig. 9

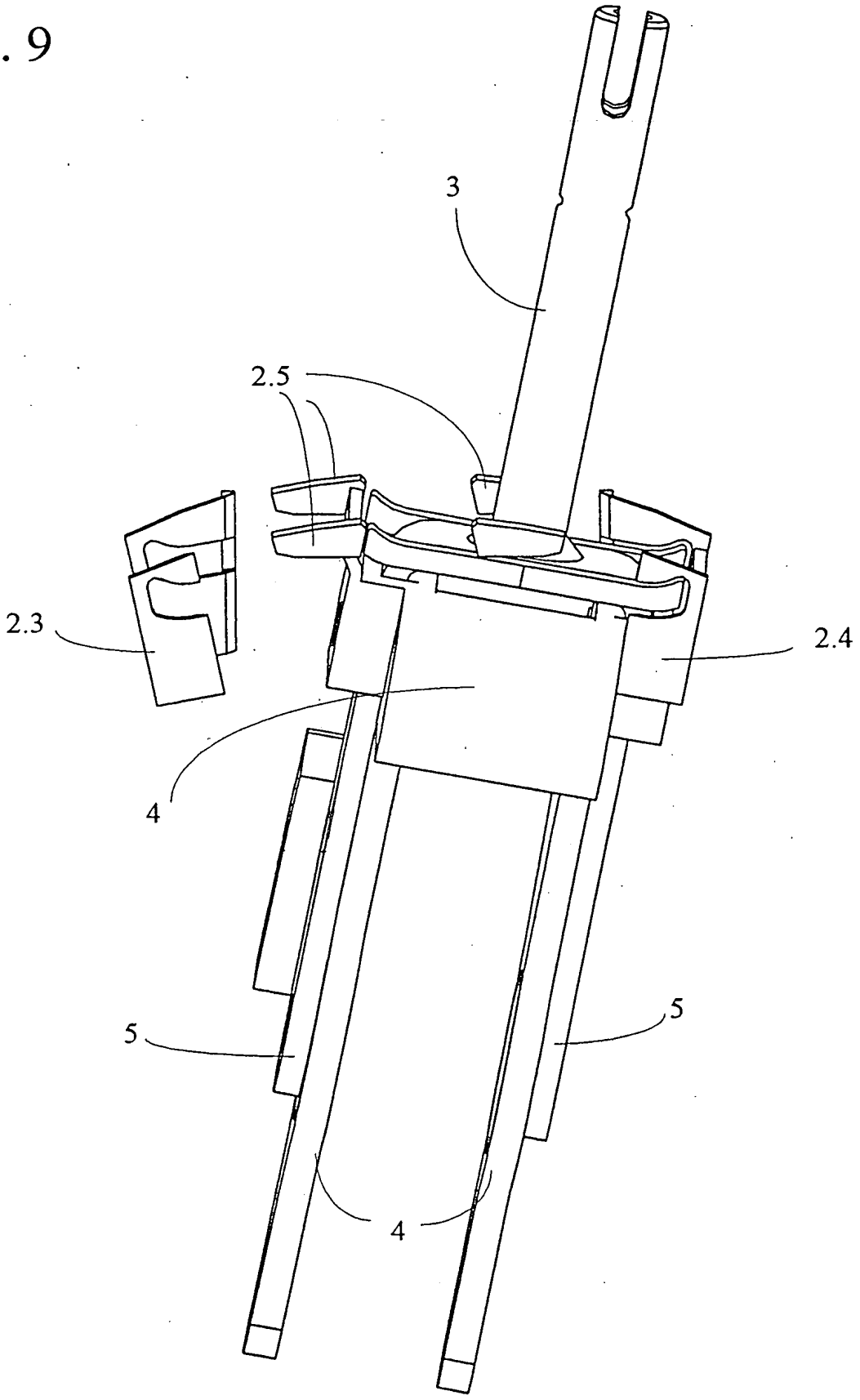


Fig. 10

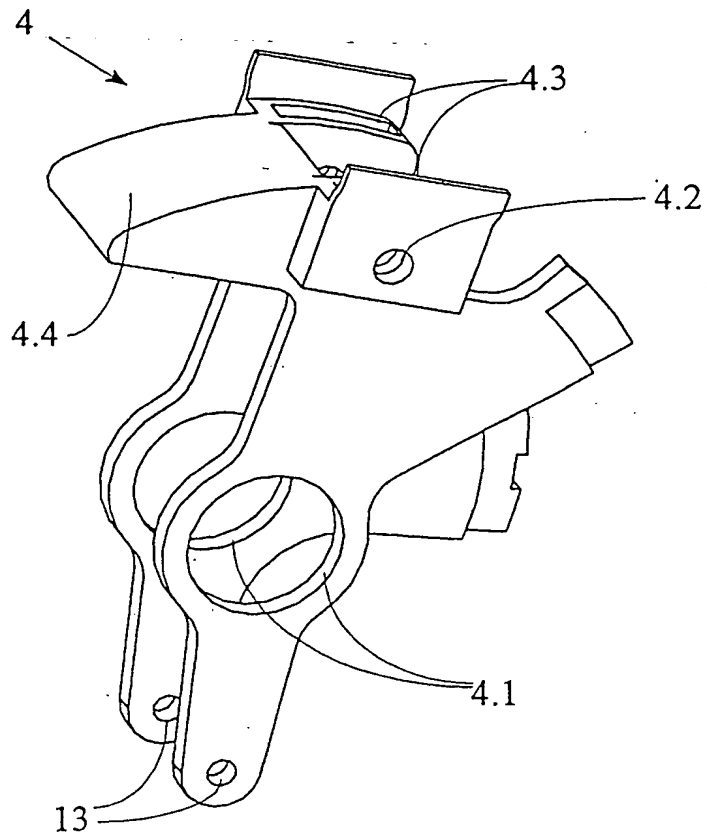


Fig. 11

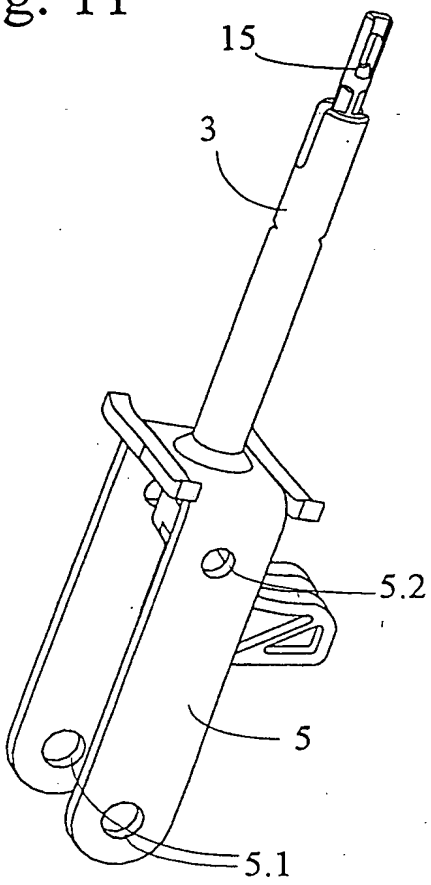


Fig. 12

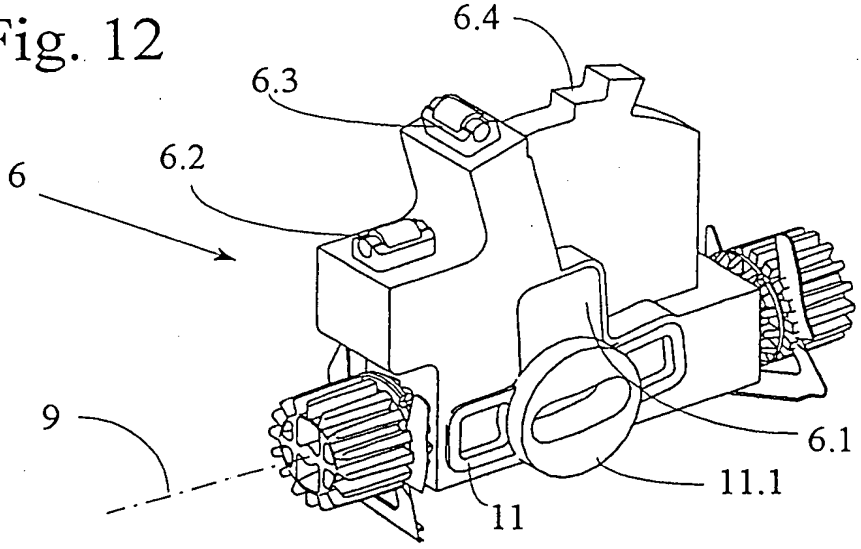


Fig. 13

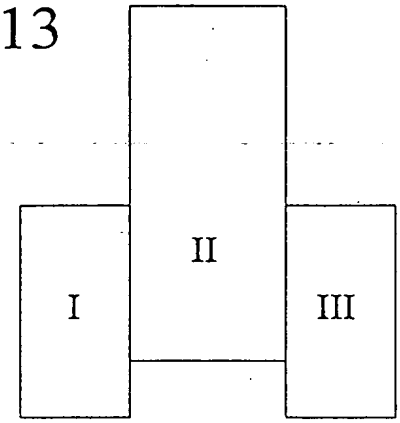


Fig. 13a

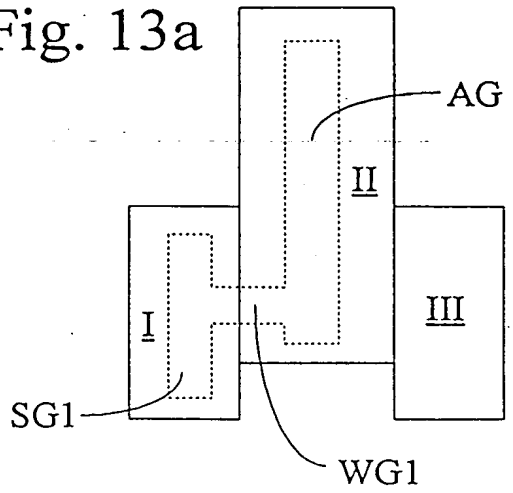


Fig. 14

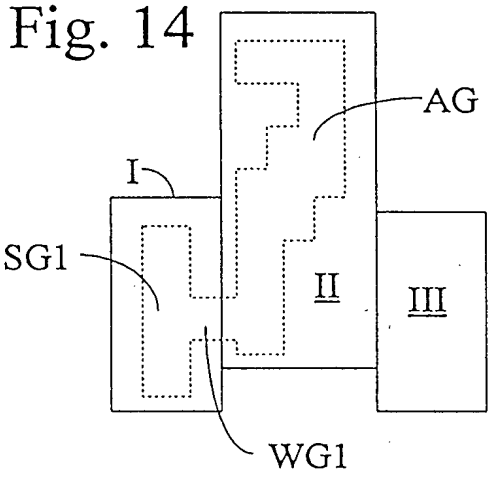


Fig. 15

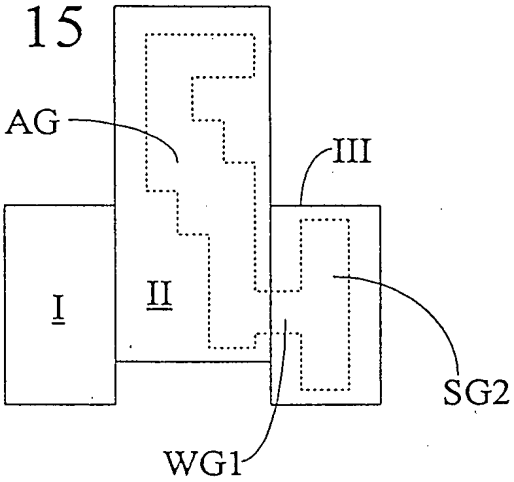


Fig. 16

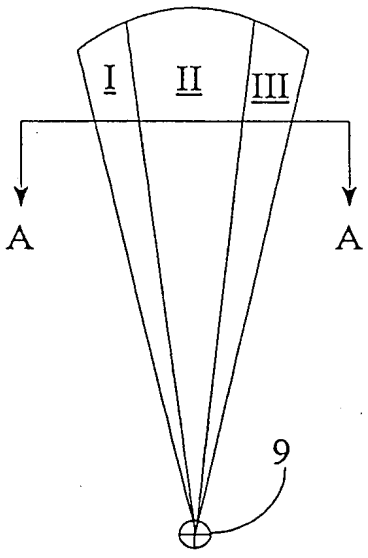


Fig. 17

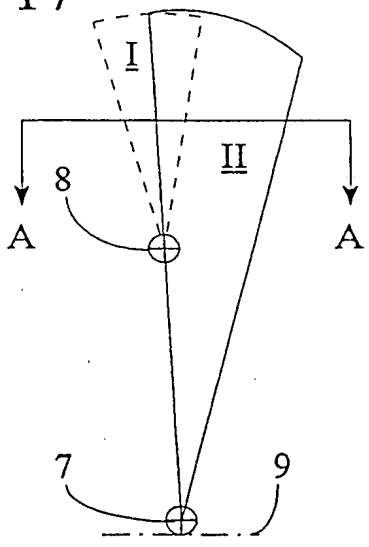
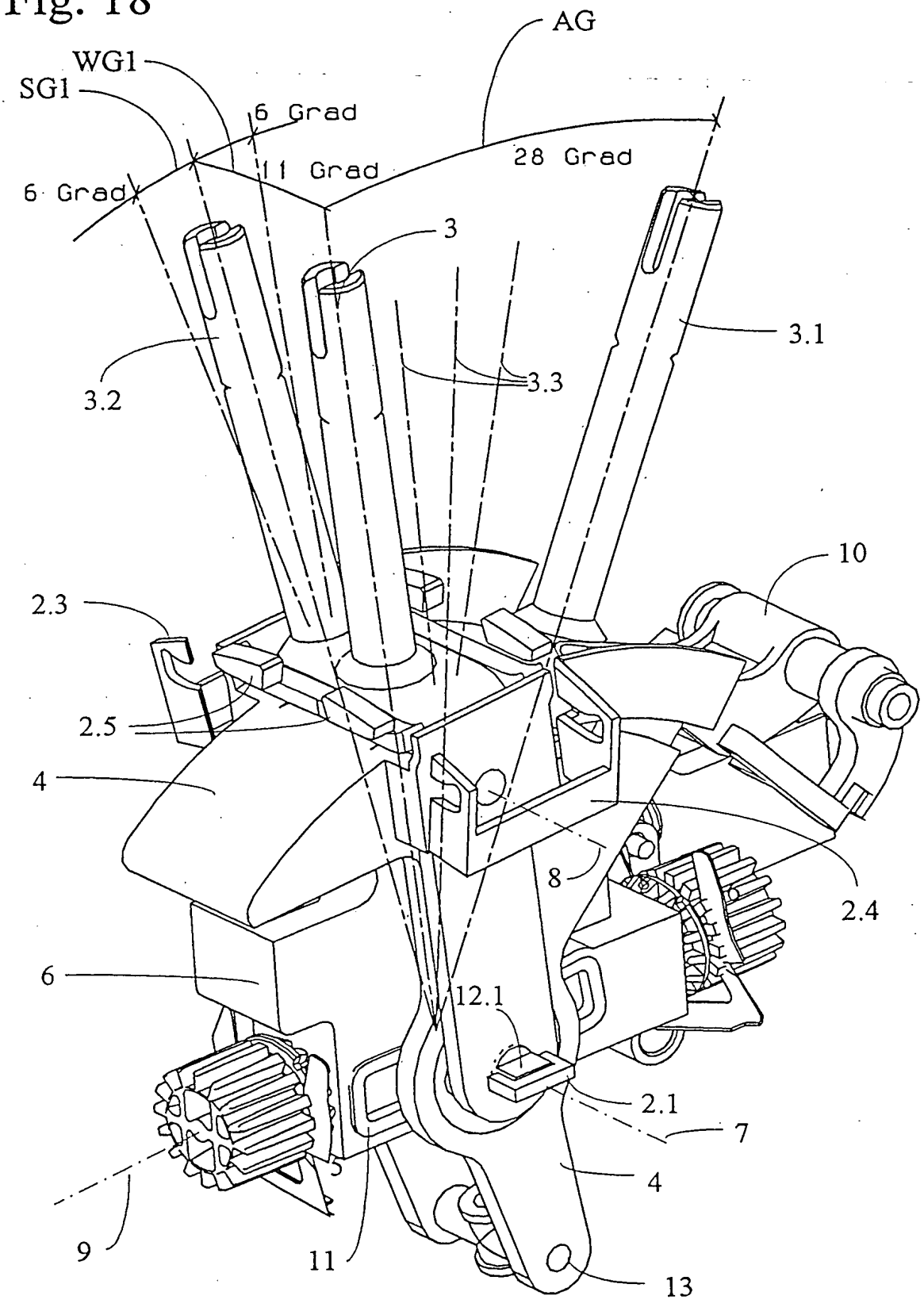


Fig. 18


AG
WG1
SG1
6 Grad
11 Grad
28 Grad
6 Grad
3
3.1
3.2
3.3
10
2.3
2.5
4
8
2.4
6
12.1
2.1
7
4
9
11
13